

# **THERMAL-SPRAYED METALLIC CONFORMAL COATINGS USED AS HEAT SPREADERS**

**Publication number:** AU2003272385 (A1)

**Publication date:** 2004-06-07

**Inventor(s):** SORGO MIKSA DE; LIONETTA WILLIAM G; OPPENHEIM SCOTT M; WATCHKO GEORGE R; RODRIGUEZ CHRISTIAN V; GAGNON MATTHEW T; LIU PETER W

**Applicant(s):** PARKER HANNIFIN CORP

**Classification:**

- international: C23C4/00; C23C4/06; C23C4/12; C23C30/00; H05K7/20; H05K9/00; C23C4/00; C23C4/06; C23C4/12; C23C30/00; H05K7/20; H05K9/00; (IPC1-7): H05K7/20; C23C4/12

- European: H05K9/00M4D; C23C4/00; C23C4/06; C23C4/12; C23C4/12G; C23C30/00; H05K7/20F

**Application number:** AU20030272385 20030915

**Priority number(s):** US20020287490 20021101; WO2003US28858 20030915

**Also published as:**

WO2004043123 (A1)

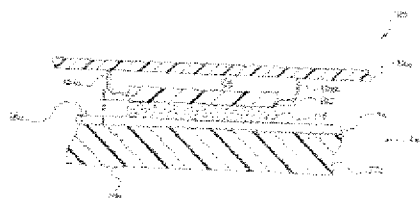
EP1561369 (A1)

CN2865209 (Y)


Abstract not available for AU 2003272385 (A1)

Abstract of corresponding document: WO 2004043123 (A1)

Heat dissipation and electromagnetic interference (EMI) shielding for an electronic device having an enclosure. An interior surface of the enclosure is covered with a conformal metallic layer which, as disposed in thermal adjacency with one or more heat-generating electronic components or other sources contained within the enclosure, may provide both thermal dissipation and EMI shielding for the device. The layer may be sprayed onto the interior surface in a molten state and solidified to form a self-adherent coating.



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**Integrated semiconductor memory with memory cells in a plurality of memory cell arrays and method of repairing said memory****Publication number:** EP1172855 (A2)**Publication date:** 2002-01-16**Inventor(s):** HARTMANN UDO (DE)**Applicant(s):** INFINEON TECHNOLOGIES AG (DE)**Classification:****- International:** G11C29/00; H01L21/66; G11C29/00; H01L21/66; (IPC1-7): H01L27/105; H01L23/525; H01L21/768**- European:****Application number:** EP20010114673 20010619**Priority number(s):** DE20001034062 20000713**Also published as:** EP1172855 (A3)**Abstract of EP 1172855 (A2)**

Ein integrierter Halbleiterspeicher weist Speicherzellen (MC, RMC) in jeweils mehreren Speicherzellenfeldern (31 bis 36, 41 bis 46) auf, die auf einem Halbleiterchip (10) jeweils in übereinander verlaufenden Ebenen (1 bis 6) angeordnet sind. Mehrere der Speicherzellen (MC, RMC) sind jeweils zu normalen Einheiten (B1, B2) und redundanten Einheiten (RB1, RB2) von Speicherzellen zum Ersetzen jeweils einer der normalen Einheiten (B1, B2) zusammengefaßt. Die normalen Einheiten (B1, B2) und die redundanten Einheiten (RB1, RB2) umfassen jeweils Speicherzellen von Speicherzellenfeldern mehrerer Ebenen (1 bis 6). Im Falle einer fehlerhaften Speicherzelle (MC1) wird die betreffende normale Einheit (B2) durch eine der redundanten Einheiten (RB2) ersetzt. Dadurch ist eine reduzierte Anzahl von programmierbaren Elementen zur Programmierung der redundanten Speicherzellen für eine Reparatur des Speichers ermöglicht.

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## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-074872

(43)Date of publication of application : 17.03.1998

(51)Int.Cl.

H01L 23/36

H01L 23/373

(21)Application number : 08-228218

(71)Applicant : SUMITOMO METAL MINING CO  
LTD

(22)Date of filing : 29.08.1996

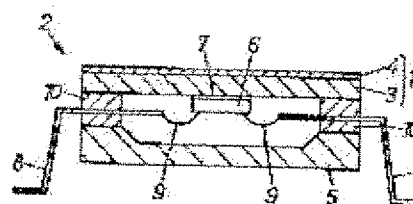
(72)Inventor : HIRAYAMA HIROSHI

## (54) HEAT SPREADER

## (57)Abstract:

PROBLEM TO BE SOLVED: To enhance a heat spreader in cooling performance, electrical insulation property, heat resistance and thermal fatigue resistance, and solvent resistance by a method, wherein at least a heat-dissipating surface of the heat spreader of copper or copper alloy whose main component is copper is covered with an insulating layer formed on the surface of the spreader.

SOLUTION: A heat spreader 1 is composed of a copper plate 3 and a fluororesin film insulating layer 4 formed on a heat dissipating area of the copper plate 3 primary surface where no semiconductor device is bonded. First, the surface of the copper plate 3 is cleaned, so as to come into good contact with an LSI chip 6 and to be bonded well to the insulating layer 4. Then, black fluororesin is applied onto the heat-dissipating area of the copper plate 3 for the formation of the insulating layer 4, the copper plate 3 is loaded into an electric oven of rack-transfer type and heated at a temperature of 230°C for thirty minutes, so as to thermoset the insulating film 4. By this setup, the insulating layer 4 superior in such characteristics as insulating property, heat resistance and thermal fatigue resistance, solvent resistance and others can be formed.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-163354

(43)Date of publication of application : 19.06.1998

(51)Int.Cl. H01L 23/06  
H01L 23/04  
H01L 23/08

(21)Application number : 08-320406 (71)Applicant : KYOCERA CORP

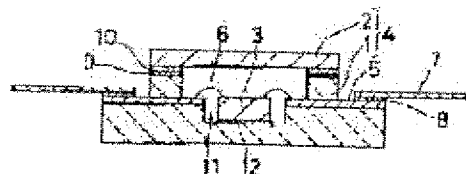
(22)Date of filing : 29.11.1996 (72)Inventor : TACHIBANA MASAKI

## (54) PACKAGE FOR HOUSING SEMICONDUCTOR DEVICE

## (57)Abstract:

PROBLEM TO BE SOLVED: To prevent the deterioration of the airtight sealing of a package for housing semiconductor device due to a thermal stress even when a nonmagnetic material, such as copper, etc., is used for the lid of the package.

SOLUTION: An insulating substrate 1 is formed of a ceramic material having a coefficient of linear thermal expansion of 10-20ppm/°C at 40-400°C. A semiconductor device 3 is housed in the recess 11 of the substrate 1 and the circumference of the device 3 is airtightly sealed by joining a lid 2 to a metallized layer 9 formed on the surface of the substrate 1 with a brazing material 10. Even when a nonmagnetic material, such as copper, a metal composed mainly of copper, etc., is used for the lid 2, the reliability of a package 4 can be improved by reducing thermal stresses, because the nonmagnetic material has a coefficient of linear thermal expansion of about 17ppm/°C which is close to that of the substrate 1.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-097871

(43)Date of publication of application : 09.04.1999

(51)Int.Cl.

H05K 7/20

G06F 1/20

(21)Application number : 09-250750

(71)Applicant : NEC GUMMA LTD

(22)Date of filing : 16.09.1997

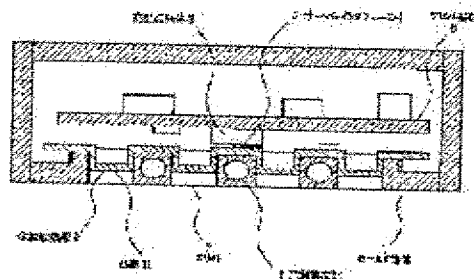
(72)Inventor : NOCHIDA KOHEI

## (54) HEAT-DISSIPATING STRUCTURE FOR CASE

## (57)Abstract:

PROBLEM TO BE SOLVED: To enhance the heat-dissipating effect of a case causing no low-temperature burn of a human body when contacting the case.

SOLUTION: At a bottom surface of a mold case 1, a thick hollow structure part 6 which comprises a cylindrical hollow with it is provided, and a plurality of through-slits 7 are provided at the hollow structure part 6. At a metal heat-dissipating plate 9 attached on an inner surface of the hollow structure part 6, a plurality of protruding parts 11, engaged with the slits 7 respectively, are provided, a tip end of the protruding part 11 is drawn in the slit 7 with a step from the surface of the mold case 1 formed, and no tip end of the protruding part 11 touches a human body, even if he touches the surface of the mold case 1. By connecting a high-temperature heat-generating body 2 to a metal heat-release plate 5 via a thermal interface material 3, the amount of heat generated by the high-temperature heat-generating body 2 is transported to the metal heat-dissipating plate 5, thus heat-dissipation is executed, while being diffused into a wide area owing to the high thermal conductivity of the metal heat-dissipating plate 5.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-094020

(43)Date of publication of application : 06.04.2001

(51)Int.Cl.

H01L 23/29

H01L 21/56

(21)Application number : 2000-251734

(71)Applicant : TEXAS INSTR INC &lt;TI&gt;

(22)Date of filing : 23.08.2000

(72)Inventor : JAAMIASU P RIBURUSU

(30)Priority

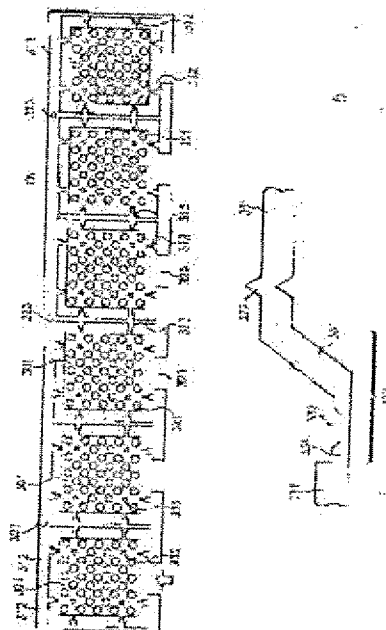
Priority number : 1999 150449 Priority date : 24.08.1999 Priority country : US

## (54) FLIP-CHIP PACKAGE PROVIDED WITH STRIP-SHAPED HEAT SPREADER AND PRODUCTION METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method for producing a thermally reinforced plastic molded flip-chip package.

SOLUTION: This method is provided with a process for providing plural copper or copper alloy strip-shaped heat spreader strips stuck to two side rails, by locating the peeler connectors of thinned cross sections, while having first and second main surfaces, a process for locating a polymer strip having plural IC packages to which flip-chip connected integrated circuits are stuck inside a mold press, a process for locating the heat spreader strips on a substrate and chip assembly, a process for injecting thermosetting plastic molding materials so as to fill a mold cavity and process for taking the molded strips out of the mold press and separating respective packages by cutting them with the substrate and the peeler connector parts of thinned cross sections.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-210769

(43)Date of publication of application : 03.08.2001

(51)Int.Cl.

H01L 23/373

(21)Application number : 2000-024694

(71)Applicant : HITACHI LTD

(22)Date of filing : 28.01.2000

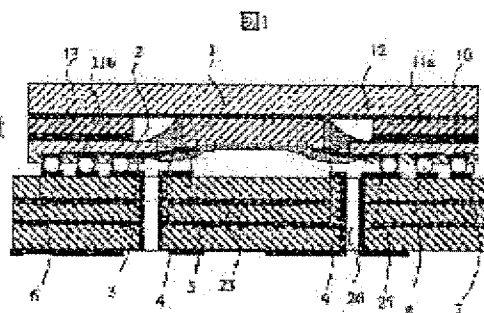
(72)Inventor : YONEDA NAE  
MIURA HIDEO

## (54) SEMICONDUCTOR DEVICE

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a semiconductor device employing a heat spreader in which heat dissipation is enhanced while ensuring reliability and strength.

SOLUTION: A composite alloy of  $\text{Cu}_2\text{O}$  and Cu sintered to have a coefficient of linear expansion smaller than that of a conventionally used copper alloy while exhibiting a high thermal conductivity comparable to that of the copper alloy employed as the material of a heat spreader.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-257296

(43)Date of publication of application : 21.09.2001

(51)Int.Cl.

H01L 23/36

// H01L 23/467

(21)Application number : 2000-114435

(71)Applicant : TOUSUI LTD

(22)Date of filing : 10.03.2000

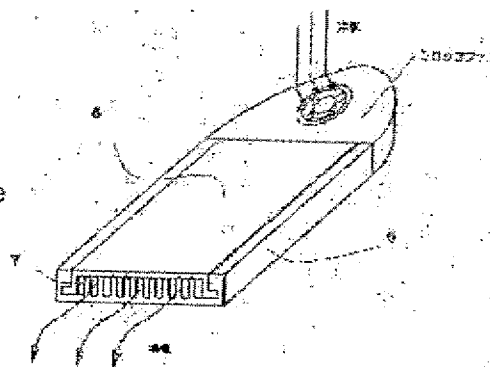
(72)Inventor : TERADA ATSUSHI

## (54) HEAT SINK

## (57)Abstract:

PROBLEM TO BE SOLVED: To manufacture a heat sink excellent in heat dissipating property without using an expensive heat pipe or the like and provide it at a low cost, by a method wherein a heat sink has a hollow part formed by engaging two members, a corrugate fin which is formed of material excellent in thermal conductivity such as aluminum and copper and molded in a corrugate shape and whose thickness is at most 0.5 mm is put in the hollow part constituted of the two members, and the corrugate fin is bonded and brought into contact with the inside of the hollow part without using adhesive agent when the two members are engaged.

SOLUTION: In this heat sink, a fin member which dissipates heat from a base and is slightly larger than a space of the hollow part and molded in a corrugate shape is put between a base member on which a heat generating element is to be mounted and a lid member which is engaged with the base member and forms the hollow part. The fin is fixed between the base member and the lid member simultaneously with engagement of the lid member with the base member and brought into contact with the base plate member and the lid member. As a result, heat is conducted from a surface of the base member to the fin member.





## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-277853

(43)Date of publication of application : 02.10.2003

(51)Int.Cl. C22C 9/00  
C22C 9/06  
C22F 1/08  
H01L 23/373  
// C22F 1/00

(21)Application number : 2002-086390

(71)Applicant : DOWA MINING CO LTD

(22)Date of filing : 26.03.2002

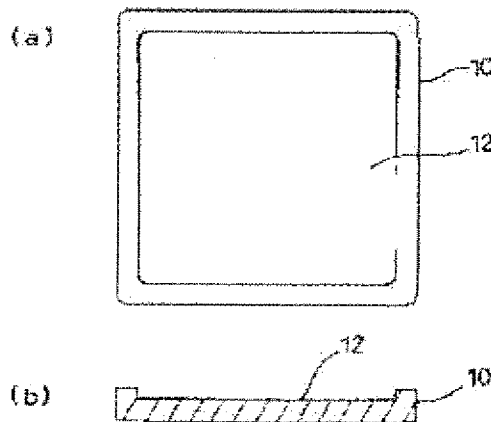
(72)Inventor : MARUTA TOSHITSUGU  
ENDO HIDEKI  
TOMOHARA KUNIIHIKO

## (54) COPPER ALLOY FOR HEAT SPREADER

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a low-cost Cu alloy for a heat spreader, which has excellent thermal conductivity and also has excellent reliability in a jointed part during an assembly step or during use because of relatively high semi-softening temperature and can be used for IC package.

SOLUTION: The Cu alloy for the heat spreader has (100 to 200) N/mm<sup>2</sup> 0.2% proof stress,  $\geq 350$  W/m.K thermal conductivity, 0.14 to 0.18 work hardening index and  $\leq 25$   $\mu$ m grain size in a width direction of a rolled surface sheet. The Cu alloy consists of 0.05 to 0.3 wt.%, in total, of P and at least one or more elements among Fe, Ni and Co and the balance Cu with inevitable components. Further, grain size after heat treatment at 600°C for 30 min after cold forging at  $\leq 40\%$  reduction of area is  $\leq 25$   $\mu$ m; and Vickers hardness after heat treatment at 600°C for 30 min after cold forging at  $\leq 40\%$  reduction of area is HV 60 to 170.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2004-296726

(43)Date of publication of application : 21.10.2004

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(51)Int.Cl. H01L 23/06  
H01L 23/12  
H01L 23/28  
H01L 23/34  
H01L 23/36  
H01L 23/373

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(21)Application number : 2003-086195 (71)Applicant : KYOCERA CORP  
(22)Date of filing : 26.03.2003 (72)Inventor : MIYAUCHI MASAHIKO

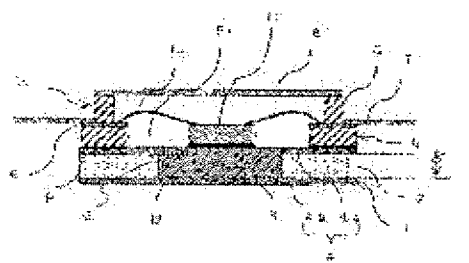
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(54) HEAT DISSIPATING MEMBER, PACKAGE FOR CONTAINING SEMICONDUCTOR  
ELEMENT, AND SEMICONDUCTOR DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To solve the problem wherein heat released from a semiconductor element in operation can not be effectively dissipated into the air.

SOLUTION: A semiconductor element containing package is equipped with a heat dissipating member 1 provided with a mount where a semiconductor element 11 is mounted, an insulating frame 5 provided with a wiring conductor 6 and fixed on the top surface of the heat dissipating member 1, and a lid member 10 mounted on the upper frame to cover the mount. In the heat dissipating member 1, a through metal body 3 formed of diamond and a silver copper alloy is embedded in the center of a frame-shaped base 2 formed of a matrix composed of tungsten or molybdenum and copper, and a copper layer 4 is bonded to the upper and lower surface of the frame-shaped base 2. It is preferable that the circumference of the through metal body 3 is larger than that of the semiconductor element 11 by the thickness of the base 2. The heat dissipating member 1 is superior in thermal conductivity, so that heat released from the



semiconductor element 11 can be efficiently dissipated outside or into the air.

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2005-183830

(43)Date of publication of application : 07.07.2005

(51)Int.Cl.

H01L 23/02

H01L 23/10

// H03H 9/02

(21)Application number : 2003-425489

(71)Applicant : TANAKA KIKINZOKU KOGYO KK

(22)Date of filing : 22.12.2003

(72)Inventor : ASADA TAKAO

(54) LID AND CLADDING MATERIAL FOR SEALING PACKAGE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a lid available with direct lid methods that not only has a thinner intermediate layer in comparison with conventional lids but also has good seal characteristics even after connection to the base.

SOLUTION: A copper-nickel alloy is employed in the intermediate layer for a lid available with the direct lid methods, and provided with an intermediate layer for relieving distortion by heating. The density of nickel in the copper-nickel alloy constituting this intermediate layer is recommended to be 20 to 50 wt%. In addition, the copper-nickel alloy is also available as a lid body. When used as a lid body, this alloy eliminates the need for providing a low thermal expansion metal layer like covar.

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2005-250441

(43)Date of publication of application : 15.09.2005

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(51)Int.Cl. G09F 9/00  
B32B 9/00  
H01J 7/24  
H01J 11/02

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(21)Application number : 2004-300426 (71)Applicant : ADVANCED ENERGY  
TECHNOLOGY INC  
(22)Date of filing : 14.10.2004 (72)Inventor : CLOVESKO TIMOTHY  
NORLEY JULIAN  
SMALC MARTIN DAVID  
CAPP JOSEPH PAUL

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(30)Priority  
Priority number : 2003 685103 Priority date : 14.10.2003 Priority country : US  
2004 844537 12.05.2004 US  
2004 897308 22.07.2004 US

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## (54) HEAT SPREADER FOR DISPLAY DEVICE

## (57)Abstract:

PROBLEM TO BE SOLVED: To enable the separation and transfer of graphite particles without peeling off with a heat spreader which comprises a graphite film for a display device, such as a plasma display panel, a light emitting diode or liquid crystal display.

SOLUTION: The heat spreader includes at least one sheet composed of compressed particles of exfoliated graphite having a surface area greater than the surface area of a local region of high temperature in the back surface of the display device. The heat spreader is a laminate including a plurality of the sheets composed of the compressed particles of the exfoliated graphite and



has a protective layer on the graphite sheet. Further, the heat spreader preferably has a surface layer of aluminum or copper sheet etc., on the surface in order to coat the heat spreader and to attain an improvement in reprocessing.

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2006-179667

(43)Date of publication of application : 06.07.2006

(51)Int.Cl.

H01L 23/02 (2006.01)

G01P 15/08 (2006.01)

(21)Application number : 2004-371102

(71)Applicant : OKI ELECTRIC IND CO LTD

MIYAZAKI OKI ELECTRIC CO LTD

(22)Date of filing : 22.12.2004

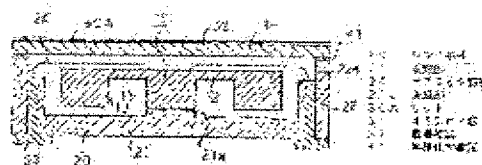
(72)Inventor : INO YOSHIHIKO

## (54) PACKAGE FOR SEMICONDUCTOR DEVICE

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a package for a semiconductor device which is thin and has a good imprint characteristic.

SOLUTION: Chromium is plated to the surface of a 42 alloy plate 31 of a thickness of about 100  $\mu\text{m}$  as a lid 30A which covers and airtightly closes a ceramic container 20 for housing the semiconductor device of an acceleration sensor 10 or the like. An about 10  $\mu\text{m}$ -thick electrodeposition coating 32 is provided by forming a black compound in the chromium plating. The lid 30A is fixed in the upper part of the side wall 22 of the ceramic container 20 by means of a thermosetting resin 41. The thickness of the thermosetting resin 41 after setting is adjusted at 20 to 30  $\mu\text{m}$ . In a conventional ceramic lid, a thickness of  $\geq 200 \mu\text{m}$  is required according to strength or the like, and laser processing is difficult. In the lid 30A, the thickness is reduced by half and easy imprint by laser is realized.



本発明の加速度センサの断面図

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-163231

(43)Date of publication of application : 18.06.1999

(51)Int.Cl.

H01L 23/36

(21)Application number : 09-321861

(71)Applicant : MITSUBISHI ELECTRIC CORP

(22)Date of filing : 25.11.1997

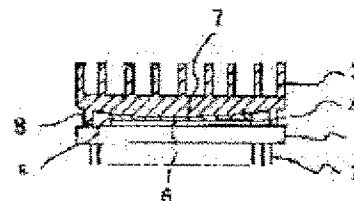
(72)Inventor : MEGURO HISAO

## (54) SEMICONDUCTOR DEVICE WITH HEAT SINK

## (57)Abstract:

PROBLEM TO BE SOLVED: To allow tight contact to a curved surface of a heat reception surface with no air reservoir occurrence, by forming a heat sink of a heat sink-attached semiconductor device allocated on a thermal conductive material on a heat spreader into such shape as convex at a central part on the side of thermal conductive material.

SOLUTION: A heat reception surface 7 of a heat sink 3 is formed into such shape as generally convex with a large-radius arc on the side of a thermal conductive material 5. Related to the order of contact between the thermal conductive material 5 coated on a flat surface 6 or a heat spreader 4 and the heat reception surface 7 of the heat sink 3, firstly the central part of the heat reception surface 7 where the arc is higher contacts, and the thermal conductive material 5 deforms along the curved surface or the heat reception surface 7 of the heat sink 3 with no gap to, thereafter, contact the outside surface of the heat reception surface 7 where the arc is lower. Here, the thermal conductive material 5 is tightly contacted to the curved surface of the heat reception surface 7 of the heat sink 3 without causing air reservoir. An excessive thermal conductive material 5 is pushed outside to be held on a package 1.





**HEAT DISSIPATING FILM IMPROVED IN HEAT CONDUCTIVITY AND SERVICE LIFE**

Publication number: JP3295260 (A)

Publication date: 1991-12-26

Inventor(s): OSADA MITSUO; ABE YUUGAKU

Applicant(s): SUMITOMO ELECTRIC INDUSTRIES

Classification:

- international: H01L23/373; H01L23/34; (IPC1-7): H01L23/373

- European:

Application number: JP19900409161 19901228

Priority number(s): JP19900409161 19901228; JP19890335981 19891229

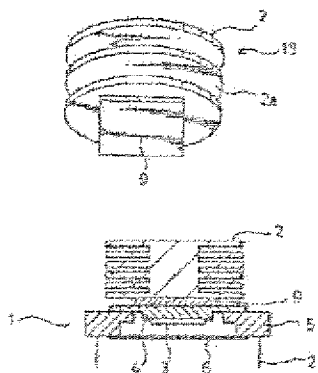
Also published as:

JP2765236 (B2)

## Abstract of JP 3295260 (A)

**PURPOSE:**To enable a heat dissipating fin which is lightweight and improved in heat conductivity to be formed by a method wherein a fin formed of aluminum alloy and a joint formed of specific composite material provided, and the fin and the joint are friction-welded together at their interface.

**CONSTITUTION:**A heat dissipating fin 13 is provided with a fin 2 of aluminum alloy and a joint 9. The joint 9 is formed of composite material formed of Mo-Cu, Cu-W, or Al-Si. The fin 2 and the joint 9 are brought into close contact with each other through friction welding at an interface between them, and the fin 2 and the joint 9 are metalically bonded together at the interface.; The joint 9 and the fin 2 are joined together through metallic bonding to form a heat dissipating fin 13, and the heat dissipating fin 13 is fixed to a semiconductor housing device 1 by bonding the joint 9 to a substrate 4 through a thermally conductive adhesive agent. The substrate 4 is formed of Mo-W composite material or Cu-W composite material, a package 5 is formed of alumina, and a lid 6 is formed of cover.



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**No title available**

Publication number: JP4006863 (U)

Publication date: 1992-01-22

Inventor(s):

Applicant(s):

Classification:

- International: G11B21/02; G11B21/02; (IPC1-7): G11B21/02

- European:

Application number: JP19900047304U 19900507

Priority number(s): JP19900047304U 19900507

Also published as:

 JP7049666 (Y2)

Abstract not available for JP 4006863 (U)

Data supplied from the *esp@cenet* database — Worldwide

**METAL PLATE BASE CIRCUIT BOARD**

Publication number: JP4186869 (A)

Publication date: 1992-07-03

Inventor(s): WATANABE CHIHARU; USAMI YOSHITAKA

Applicant(s): DENKI KAGAKU KOGYO KK

Classification:

- International: H05K1/05; H01L23/12; H01L23/14; H01L23/373; H05K7/20; H05K1/05; H01L23/12; H01L23/34; H05K7/20; (IPC1-7): H01L23/12; H01L23/14; H01L23/373; H05K1/05; H05K7/20

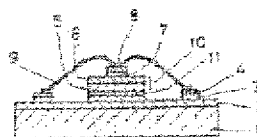
- European:

Application number: JP19900317091 19901121


Priority number(s): JP19900317091 19901121

**Abstract of JP 4186869 (A)**

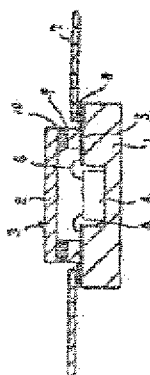
**PURPOSE:** To prevent the generation of cracks in solder for a base metal plate, by mounting a heat spreader for semiconductor, which spreader is composed of at least two kinds of metal plates whose thermal expansion coefficients are different.  
**CONSTITUTION:** A desired circuit is formed by using a metal board constituted of an aluminum plate as a base plate 1, a glass cloth impregnated with epoxy resin as an insulating layer 2, and a copper foil as a copper circuit 3. The whole surface of a plate formed by rolling clad of copper/molybdenum is plated with nickel, and a heat spreader 10 is formed. By using high temperature heat-resistant solder 7, a semiconductor chip 8 being silicon semiconductor is soldered on the molybdenum metal plate side turning to a heat spreader 6 for low thermal expansion coefficient use of the heat spreader 10.; By using eutectic solder 11, the copper metal plate side turning to a heat spreader 5 for high thermal expansion coefficient use of the heat spreader 10 is soldered on the copper circuit 3. Hence a metal plate base circuit board is formed.



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**SEMICONDUCTOR ELEMENT HOUSING PACKAGE****Publication number:** JP4280653 (A)**Publication date:** 1992-10-06**Inventor(s):** TANAKA EMIKO**Applicant(s):** KYOCERA CORP**Classification:****- international:** H01L23/08; H01L23/02; H01L23/04; H01L23/06; H01L23/02;  
(IPC1-7): H01L23/08**- European:****Application number:** JP19910068930 19910308**Priority number(s):** JP19910068930 19910308**Also published as:** JP2813072 (B2)**Abstract of JP 4280653 (A)**

**PURPOSE:** To provide a semiconductor element housing package excellent in airtightness by a method wherein an insulator and a metal lid are firmly joined together. **CONSTITUTION:** A metal lid 2 is formed of a metal body where a copper coating layer is deposited on the outer surface of a core as thick as 20 to 40% of the core in cross section, where the core concerned is formed of alloy composed of 41.5 to 42.5% by weight of nickel and 57.5 to 58.5% by weight of iron. The metal lid 2 is proximate in thermal expansion coefficient to an insulating base 1 of multilayer sintered body where a semiconductor integrated circuit element 4 is housed, so that the metal lid 2 and the insulating base 1 can be very firmly joined together.



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## PACKAGE FOR SEMICONDUCTOR DEVICE

Publication number: JP4290250 (A)

Publication date: 1992-10-14

Inventor(s): TANAKA EMIKO

Applicant(s): KYOCERA CORP

Classification:

- international: H01L23/04; H01L23/02; H01L23/06; H01L23/08; H01L23/02;  
(IPC1-7): H01L23/04; H01L23/08

- European:

Application number: JP19910080823 19910318

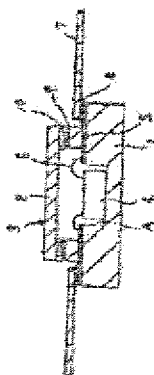
Priority number(s): JP19910080823 19910318

Also published as:

JP2813073 (B2)

## Abstract of JP 4290250 (A)

**PURPOSE:**To provide a package for containing a semiconductor chip, in which an insulating base body and a metal lid body have been bonded firmly and whose airtight sealing reliability at the inside of a container is high. **CONSTITUTION:**A metal lid body 2 is formed of a metal body in which copper sheets having a thickness of 10 to 20% with reference to the thickness of a sheetlike body have been bonded to the surface and to the rear surface of the sheetlike body which is composed of an alloy composed of the following: 28.5 to 29.5wt.% nickel; 15.5 to 26.5wt.% cobalt; and 54.0 to 56.0wt.% iron.; The coefficient of thermal expansion of the metal lid body 2 is close to the coefficient of thermal expansion of an insulating base body 1 which houses a semiconductor integrated circuit element 4 and which is composed of a mullite sintered body; the metal lid body 2 is bonded to the insulating base body 1 extremely firmly.



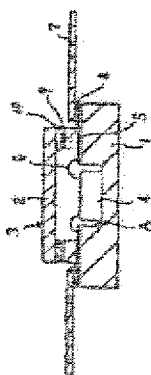
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**PACKAGE FOR SEMICONDUCTOR DEVICE****Publication number:** JP4290251 (A)**Publication date:** 1992-10-14**Inventor(s):** TANAKA EMIKO**Applicant(s):** KYOCERA CORP**Classification:****- international:** H01L23/08; H01L23/02; H01L23/04; H01L23/06; H01L23/02;  
(IPC1-7): H01L23/08**- European:****Application number:** JP19910080824 19910318**Priority number(s):** JP19910080824 19910318**Also published as:**

JP2613074 (B2)

**Abstract of JP 4290251 (A)**

**PURPOSE:**To provide a package for containing a semiconductor chip, in which an insulating base body and a metal lid body have been bonded firmly and whose airtight sealing reliability at the inside of a container is high. **CONSTITUTION:**A metal lid body 2 is formed of a metal body in which a coating layer composed of an alloy composed of 28.5 to 29.5wt.% nickel, 15.5 to 16.5wt.% cobalt and 54.0 to 56.0wt.% iron has been applied to the outer surface of a core body composed of copper in such a way that the cross-sectional area of the coating layer is 7.2 to 8.8 times of the cross-sectional area of the core body.; The coefficient of thermal expansion of the metal lid body 2 is close to the coefficient of thermal expansion of an insulating based body 1 which houses a semiconductor integrated circuit element 4 and which is composed of a multilayer sintered body; the metal lid body 2 is bonded to the insulating base body 1 extremely firmly.



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**HEAT RADIATOR**

Publication number: JP5326772 (A)

Publication date: 1993-12-10

Inventor(s): NAKAMURA YUKIO

Applicant(s): MATSUSHITA ELECTRIC IND CO LTD

Classification:

- international: H01L23/42; H01L23/34; (IPC1-7): H01L23/42

- European:

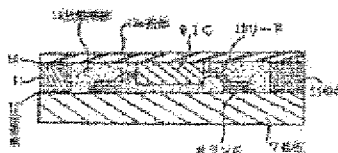
Application number: JP19920158708 19920525

Priority number(s): JP19920158708 19920525

**Abstract of JP 5326772 (A)**

**PURPOSE:**To enable heat released from an IC to be absorbed into a heat dissipating solution so as to realize a heat radiator excellent in heat dissipating properties and small in volume.

**CONSTITUTION:**Lands 8 of copper electrodes are formed on the upside of a board 7, and an IC 9 is mounted on the board 7 by soldering the leads 10 of the IC 9. A frame 11 is fixed to the surface of the board 7 surrounding the IC 9 by bonding agent 12, and an IC mounting section surrounded by the frame 11 is filled with fluorine heat dissipating solution 15 such as fluorinarte or the like, a metal lid 13a of aluminum or copper is bonded to the upside of the frame 11 with bonding agent 14 into one piece, and the heat dissipating solution 15 is hermetically sealed up by the frame 11 and the lid 13a.



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# MULTIPLE LAYER LEAD FRAME AND MANUFACTURING METHOD THEREOF

Publication number: JP7263605 (A)

Publication date: 1995-10-13

Inventor(s): OTAKA TATSUYA; KAMEYAMA YASU HARU; AKINO HISANORI; TAKAHAGI SHIGEJI; YONEMOTO TAKAHARU

Applicant(s): HITACHI CABLE

Classification:

- international: H01L23/28; H01L21/52; H01L21/56; H01L23/50; H01L23/28; H01L21/02; H01L23/46; (IPC1-7): H01L23/50; H01L21/52; H01L21/56; H01L23/28

- European:

Application number: JP19940055558 19940325

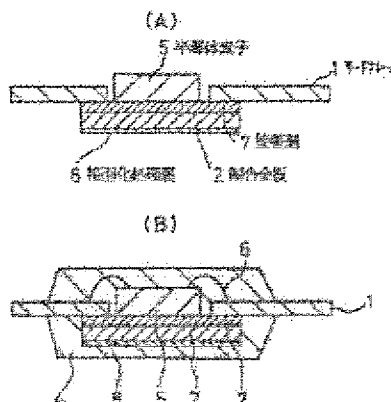
Priority number(s): JP19940055558 19940325

Also published as:

JP3186408 (B2)

## Abstract of JP 7263605 (A)

**PURPOSE:** To effectively avoid the reflow cracking caused between a metallic sheet and a mold resin at the solder reflowing time by improving the bonding properties between the metallic sheet and the mold resin. **CONSTITUTION:** A copper alloy sheet 2 to be a heat spreader is laminated on the title multiple layer lead frame 1. Besides, a surface roughened layer 6 is formed on the copper alloy sheet 2 coming into no contact with the lead frame 1. On the other hand, a bonding agent 7 is provided on the copper alloy sheet 2 coming into contact with the lead frame 1 so as to bond a semiconductor element 5 on the lead frame 1. At this time, the surface roughened layer 6 is formed by AC roughening process, electrolytic roughening process or black color oxidation roughening process. Furthermore, either thermoplastic bonding agent to the bonding agent or thermosetting bonding agent may be applicable to the bonding agent 7. Although the copper alloy sheet 2 having the self-contained type in a mold resin 4 may be further corrosion preventively processed after performing the surface roughening processes.



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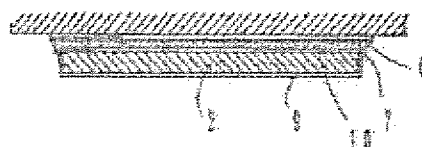


**MANUFACTURE OF CERAMIC PACKAGE****Publication number:** JP8241941 (A)**Publication date:** 1996-09-17**Inventor(s):** NARUSHIGE KEIJI**Applicant(s):** SUMITOMO KINZOKU ELECTRO**Classification:****- International:** H01L23/373; H01L23/40; H01L23/34; (IPC1-7): H01L23/373; H01L23/40**- European:****Application number:** JP19950070565 19950303**Priority number(s):** JP19950070565 19950303**Also published as:**

JP3222348 (B2)

**Abstract of JP 8241941 (A)**

**PURPOSE:** To reduce the warp of a package base body when a heat spreader is brazed to the rear of the package base body comprising a recessed part on which an electronic component is to be mounted by a method wherein a copper plate is used as the heat spreader and a brazing temperature is specified. **CONSTITUTION:** A package base body 1 comprises a chip mounting part 4 composed of a cavity (a recessed part) on which a semiconductor chip 3 is to be mounted in the central part, and a plurality of external terminals 5 are erected and installed around a face on the side on which the chip mounting part 4 has been formed. A heat spreader 2 which is fixed and bonded to the rear 1a of the package base body 1 is formed of a copper plate, and an Ni-plated layer 9 is formed on the whole face of the heat spreader 2. The package base body 1 and the heat spreader 2 are fixed and bonded by a silver brazing material 10. At this time, a brazing operation is performed at a temperature within a range of the melting point of the brazing material to the melting point plus 20 deg. C while a load at  $7.6\text{g/cm}^2$  or higher is being applied to the heat dissipating face of the heat spreader.



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## SEMICONDUCTOR DEVICE

Publication number: JP8298299 (A)

Publication date: 1996-11-12

Inventor(s): OGAWA TOSHIO; TAKAHASHI MASAOKI; KAMIMURA NORITAKA; AIDA MASAHIRO; EGUCHI KUNIYUKI; SUZUKI KAZUHIRO; HATTORI MOTONOBU; HANEI HIROYUKI

Applicant(s): HITACHI LTD

Classification:

- international: H01L23/26; H01L23/29; H01L23/31; H01L25/07; H01L25/18; H01L23/28; H01L25/07; H01L25/18; (IPC1-7): H01L23/28; H01L23/29; H01L23/31; H01L25/07; H01L25/18

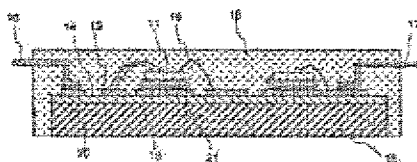
- European:

Application number: JP19950103404 19950427

Priority number(s): JP19950103404 19950427

## Abstract of JP 8298299 (A)

**PURPOSE:** To realize a compact, high-reliability power semiconductor device by constituting a device with a resin mold in one united body in a power semiconductor device having a construction of protecting a circuit system with a resin-based mold. **CONSTITUTION:** An insulating substrate is produced by thermally bonding together under pressure an epoxy-based insulating layer 14 on the surface of one side of a metal base substrate 15. A copper conductor layer is formed on the insulating layer 14, etching removal is selectively performed, and a conductor pattern 13 having a predetermined shape is formed. On the other hand, a power semiconductor element 11 is jointed on a heat spreader consisting of copper chips by using high-temperature solder 21. This jointing member is fixed with low-temperature solder 20 on the conductor pattern 13 prepared in advance. At this time, other chip parts may be jointed at the same time. A series of circuits thus prepared are set in metal molds set to a predetermined temperature, and a resin mold 18 is molded in one united body, thereby obtaining a compact, high-performance power semiconductor device.



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**SEMICONDUCTOR DEVICE AND ITS MANUFACTURE**

Publication number: JP9102559 (A)

Publication date: 1997-04-15

Inventor(s): SAWAI AKIYOSHI; ONO YUKIMITSU; ICHIHAMA HIDEYUKI;  
ASAI KATSUNORIApplicant(s): MITSUBISHI ELECTRIC CORP; RYODEN  
SEMICONDUCTOR SYST ENG

Classification:



- international: H01L23/12; H01L23/04; H01L23/367; H01L23/12;  
H01L23/02; H01L23/34; (IPC1-7): H01L23/12

- European: H01L23/04; H01L23/367W

Application number: JP19950257671 19951004

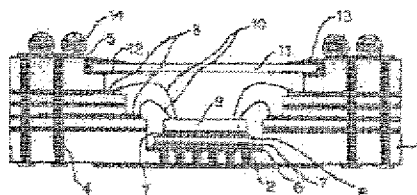
Priority number(s): JP19950257671 19951004

Also published as:

 JP3292798 (B2) US5814883 (A) KR100228595 (B1)

Abstract of JP 9102559 (A)

**PROBLEM TO BE SOLVED:** To increase the number of pins, reduce the arranging pitch of the pins, and improve the heat radiating characteristic and mountability by housing a semiconductor chip in a recessed section formed at the central part of a substrate and forming a plurality of ball-like external electrodes on the upper surface side of the chip, and then, closing the recessed section with a lid and forming thermal via holes on the lower surface side of the chip. **SOLUTION:** A semiconductor chip 9 is housed in a recessed section formed at the central part of a substrate 1 and a plurality of ball-like external electrodes 14 is formed on the upper surface side of the chip 9. The recessed section is closed with a lid 11 and thermal via holes 2 are formed on the lower surface side of the chip 9. The via holes 2 are formed by plating copper through holes. The via holes 2 are filled up with a resin. When the area of the lid 11 is  $\geq 300\text{mm}^2$ , in addition, the lid 11 is made of a ceramic.



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